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Food insecurity, social capital and perceived personal disparity in a predominantly rural region of Texas: an individual-level analysis

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Abstract

Few studies have addressed the association of food insecurity with place of residence and perceptions of collective social functioning such as perceived social capital and perceived personal disparity. This study assessed the association between food insecurity and measures of perceived personal disparity and perceived social capital in a region of Central Texas, USA comprised of one urban and six rural counties. Food insecurity, perceived social capital, perceived personal disparity, and sociodemographic control measures were derived from the 2006 Brazos Valley Community Health Assessment on an analytic sample of 1,803 adult participants (74% response rate). Robust multinomial regression models examined associations between food insecurity and perceived personal disparity, perceived social capital, education, age, residence in a poor or low-income household, minority group membership, and rural residence. A model was estimated for food insecurity ($n = 1803$, $p < 0.0001$). Residents with low social capital, higher levels of perceived personal disparity, rural residence, residence in a low-income or poor household, minority group membership, and lower levels of educational attainment were more likely to experience food insecurity. Rural residence ($p = 0.021$) was significant only for the comparison between those who never, and those who often experienced food insecurity, and findings for the stratified rural and urban samples were roughly equivalent to the combined sample. Individual level measures of collective social functioning are important correlates of food insecurity. In this study, both perceived personal disparity and perceived social capital play an important role, regardless of rural or urban residence.

Keywords

social capital; inequality; perceived personal disparity; food insecurity; urban; rural; collective social functioning; USA

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Introduction

Food insecurity, which in the U.S. context means having insufficient access to enough food for a healthy and active life among all members of a household, was a problem among 14.6% of American households in 2008 (Nord, Andrews, & Carlson, 2009) and has been shown to become worse over time, especially among vulnerable populations (Sharkey, 2005). Among American households, 5.7% had reduced food intake among one or more members and disrupted eating patterns caused by lack of money or other resources (Nord, Andrews, & Carlson, 2009). Food insecurity is responsible for a number of harmful dietary consequences. The people suffering food insecurity in the U.S. context tend to consume significantly less fruit, vegetables, fiber and potassium than the food secure, and form a significantly greater percentage of those who consume less than the Institute of Medicine's recommended daily allowance for vitamin C and the recommended five-daily servings of fruits and vegetables (Kendall, Olson, & Frongillo, 1996). Studies have demonstrated that food insecurity is related to overweight among women (Adams, Grummer-Strawn, & Chavez, 2003; Townsend, Peerson, Love, Achterberg, & Murphy, 2001) and low intakes of key nutrients and increased burden of multimorbidity among older adults (Sharkey, 2003). One likely mechanism involves the relative cheapness in the U.S. of energy-dense compared to nutrient-rich foods (Drewnowski, 2004). Households at risk of running out of food may be more likely to consume energy-dense foods leading to a prevalence of obesity and overweight among low-income households and those at or below the poverty level (Dietz, 1995; Drewnowski, 2004).

To stave off food insecurity, food must first be available and accessible (Wolfe & Frongillo, 2001). What factors account for variations in availability and accessibility to resources such as food? The conceptual model in Figure 1 provides a framework for understanding these variations. The model shows food insecurity as the outcome of a variety of factors that determine food accessibility, including residential setting, perceived collective social functioning which accounts for plausible causal links between perceptions of collective social functioning and food insecurity such as individual experiences with communally-based means of food redistribution, and a range of personal characteristics.

Recent work provides spatial explanations for variations in food accessibility. One research stream focuses on the importance of rural or urban setting. This literature has reported that urban residents have greater access than rural residents to the goods and services essential for maintaining one's health (Jensen, McLaughlin, & Slack, 2003; Lobao & Saenz, 2002). Impoverished rural and urban settings are understood to be contexts for opportunity structures that limit or enhance the availability of food (Macintyre, Ellaway, & Cummins, 2002). A rural rather than an urban setting negatively impacts food availability. In rural settings there is less variety of healthy foods (Kaufman, 1998; Smith & Wright Morton, 1994), food quality or freshness is lower, and food is more expensive than in urban settings (Morris, Neuhauser, & Campbell, 1992; Smith & Wright Morton, 1994; Dunn, Sharkey, Lotade-Manja, Bouhlal, Nayga, N.D.). Accessibility is also impacted by location (Blanchard & Lyson, 2006; Dean & Sharkey, N.D.; Furey, Strugnell, & McIlveen, 2001; 1999; Kaufman, 1998; Prochaska, Sharkey, Ory, & Burdine, 2006; Sharkey, 2009; Sharkey & Horel, 2008; Sharkey, Horel, & Dean, 2010; Sharkey, Johnson, & Dean, 2010). In a nationwide study of New Zealand, community resources such as supermarkets were found to be less accessible to individuals in deprived areas in a rural environment than in an urban environment (Pearce, Witten, Hiscock, & Blakely, 2008). In Central Texas where our study was conducted, rural residents must travel greater distances than urban residents to supermarkets and supercenters which reduces their access to fruit and vegetable retail outlets and is associated with lower consumption of those foods (Dean & Sharkey, N.D.). The severity of food insecurity varies across geographical settings, especially at the regional

level, but a recent USDA-ERS report did not find a simple disparity between urban and rural settings. Instead, both large cities and rural settings were the most food insecure, and suburban and other areas immediately surrounding large cities were more food secure (Nord et al., 2009).

Research also points to the impact of collective social functioning on an individual's ability to access food (Garasky, Wright Morton, & Greder, 2004, 2006; Locher, Ritchie, Roth, Baker, Bodner, & Allman, 2005; Wright Morton, Bitto, Oakland, & Sand, 2005). Following Macintyre et al. (2002), collective social functioning refers to the social, cultural and historical commonalities of a particular community. Social capital is one concept that accounts for the role of collective social functioning in the accessibility of resources (Macintyre et al., 2002). It has been defined as the combined resources which derive from an individual's mutually recognized social relations (Bourdieu, 1986). Thus, social capital refers to the capital a social actor can create or employ by virtue of their access to a social collectivity. It is not a resource, but as capital its use allows an individual access to resources (Portes, 1998). Portes describes three effects of social capital: it allows for greater social control, provides family support, and provides support and other benefits outside of families (Portes, 1998).

The principal finding of research on social capital and health is that high social capital is associated with positive health outcomes. For example, Kawachi *et al.* discovered strong correlations between indicators of social capital aggregated at the state level and mortality rates (Kawachi, Kennedy, Lochner, & Prothrow-Stith, 1997) as well as self-reported health (Kawachi, Kennedy, & Glass, 1999).

This importance is reflected in recent work on the associations between social capital and a range of nutritional outcomes. Individual-level indicators of social capital were positively associated with higher levels of fruit and vegetable intake in Central Texas (Johnson, Sharkey, & Dean, 2010). High levels of social capital were negatively associated with risk of malnutrition among African-Americans (Locher et al., 2005). In an urban sample from Hartford, Connecticut, high social capital at the individual-household and neighborhood levels was positively associated with a decreased risk of hunger (Martin, Rogers, Cook, & Joseph, 2004), defined as the "uneasy or painful sensation caused by a lack of food (Bickel, Nord, Price, Hamilton, & Cook, 2000)." Finally, in a four-nation study of maternal social capital and the nutritional status of children, cognitive social capital or the subjective evaluation of social capital was positively associated with greater nutritional status among children in Peru, Vietnam, Ethiopia, and the State of Andhra Pradesh in India (De Silva & Harpham, 2007).

The common explanatory thread across this research is familial and extra-familial support and its positive impact on access to the resources requisite for healthy living. The implication is that possessing some measure of social capital means greater access to resources through one's social interactions with others in the community, or with various kinds of civic entities. This is exemplified by research using concepts such as informal social support, or the resources available through networks of friends and family members (S. Garasky et al., 2006), as well as individual-level perceptions of strong civic structure, namely a belief that local leaders and institutions are working effectively to ameliorate food insecurity (Wright Morton et al., 2005). Both concepts were positively associated with food security, and attest to the role of collective social functioning in creating access to food resources.

Studies that tie social capital to health outcomes vary in their levels of measurement. As social capital is a communal phenomenon, some have argued measures of social capital

should be contextual (Kawachi et al., 1997; Lochner, Kawachi, & Kennedy, 1999). In other words, they should direct our attention to elements of the local social environment that enable access to resources (Macintyre et al., 2002). Contextual accounts have constructed measures of social capital from empirical accounts of social organization such as the number and impact of local charities or health-care facilities (Veenstra, 2005), and from aggregated measures of individual responses to questions about their community (Kawachi & Kennedy, 1997; Martin et al., 2004).

Some scholars have found an association between individual-level measurements of social capital and food security (S. Garasky et al., 2006; Martin et al., 2004) and nutritional risk (Locher et al., 2005), with associations in the same direction as aggregated measurements. This research suggests the importance of focusing on an individual's engagement with the social environment. They argue it is appropriate to use individual-level measurements of social capital because the access of specific individuals to communally-based resources is rooted in these individuals' engagement with their community (Innes, 1994; Locher et al., 2005; Wright Morton et al., 2005; Veenstra, 2000).

A variety of communally-based resources may serve as causal mechanisms that intervene between an individual's positive evaluation of their social environment and their status as food secure. Wright Morton et al. have identified two forms of economy that may ameliorate food insecurity; reciprocal economies—receiving support from family or friends—and distributional economies or institutional support (2008). In the U.S., distributional economies include state run services such as the Food Stamp Program, now called the Supplemental Nutrition Assistance Program (SNAP), which provides assistance to impoverished households to purchase food stuffs, and Women, Infants and Children (WIC) which provides aid to pay for supplemental foods, health care and nutrition education for low-income pregnant and postpartum women and infants and children at nutritional risk up to age five; private charities including a variety of meal kitchens and food pantries; and public and private hybrids such as state and local food banks which operate from public and private grants and food donations (Wright Morton et al., 2008). Reciprocal economies refer to the sharing of food among friends, family members, neighbors and other community members outside of a formalized setting. This food may come from a variety of sources including retail outlets, the distributional economy, hunting, or local gardens (Wright Morton et al., 2008). We suggest that food insecure individuals who express low levels of social capital may have formed negative impressions of their community based on a lack of sufficient distributional or reciprocal resources within their community, or an inability to access these resources when they are present.

Alongside social capital, another aspect of collective social functioning that has been tied to the health and well being of individuals is that of income inequality, defined as the gap between the incomes of the rich and the poor, and measured at an aggregate community level (Kawachi & Kennedy, 1999; Macintyre et al., 2002; Wilkinson, 1999). A large number of studies have found associations between income inequality and health outcomes, especially mortality. One study correlated levels of income inequality with age-specific mortalities, and rates of low birth weight, work disability, expenditures on medical care, smoking, and sedentary activity (Kaplan, Pamuk, Lynch, Cohen, & Balfour, 1996). In a Japanese study income inequality negatively impacted a range of health outcomes, controlling for individual-level measures of income (Oshio & Kobayashi, 2009). In a comparison of 21 U.S. states, the household income inequality index defined by the proportion of income received by the top 50% of income within the state was found to be positively correlated with self-reported abdominal weight gain (Kahn, Tatham, Pamuk, & Heath Jr, 1998). A study of 21 developed countries found that greater gaps in income inequality were positively correlated with higher percentages of diet-related health problems

including obesity among men and women, diabetes mortality rate per million people, and caloric intake. The authors of this study suggest that diet-related health problems are exacerbated in part by factors associated with the extent to which a society is hierarchically structured (Pickett, Kelly, Brunner, Lobstein, & Wilkinson, 2005).

We suggest that measurements of an individual's subjective experience of personal disparity in access to resources, both financial and social, are likely to be associated with dietary health outcomes. We postulate a causal link between perceived personal disparity and food insecurity to reflect experiences with the unequal distribution of food and food-related resources. In the U.S., distributional food economies such as SNAP (Gorman et al. 2006) and WIC (McIntosh, 1996; Garasky et al., 2004) are not employed by many eligible participants. Seefeldt and Castelli (2009) discovered that many single mothers who are qualified for food assistance at least part of the time have difficulty accessing benefits when needed because their volatile incomes result in periods when they are ineligible. These mothers also experienced what they described as an intractable food assistance bureaucracy with little patience for their highly variable circumstances. The limited distribution of these resources and the difficulties experienced by many attempting to access them in times of need suggest that many of the food insecure may experience services to be unjustly distributed. A further link between food insecurity and personal disparity is suggested by Gee, Lively, Larsen, Keith, Stone, & MacLeod (2007) who discovered in a mixed-methods study of depression among emergency food service patrons that food insecurity was associated with reports of discrimination. They argue that patrons reduced their use of these services as a result of discriminatory experiences with emergency food services.

A range of personal characteristics which determine access to resources have been associated with food insecurity. Educational attainment is positively associated with being food secure (Alaimo, Briefel, Frongillo Jr, & Olson, 1998; Kendall, Olson, & Frongillo Jr, 1995; Lee & Frongillo, 2001; Rose, 1999). Low-income status was found to be negatively associated with food security (Kaiser, Melgar-Quinonez, Lamp, Johns, Sutherlin, & Harwood, 2002; Kendall et al., 1995; Rose, 1999). Being at or below the poverty line is also characteristic of the food insecure (Lee & Frongillo, 2001; Nord et al., 2009). In the U.S., those 60 years of age or older have access to Federal food-assistance programs which, in turn, improves their food access. This has been negatively associated with food insecurity (Alaimo et al., 1998; Hamilton, Cook, Thompson, Buron, Frongillo Jr, Olson et al., 1997; Rose, 1999). Race and ethnicity have also been associated with food insecurity. Food insecurity was positively correlated with being Hispanic (Alaimo et al., 1998; Nord et al., 2009) and African American (Nord et al., 2009).

This study addresses a number of gaps in the literature on food insecurity. Although comparative research has been done on the relationship between individual perceptions of the social environment and nutritional health outcomes in rural and urban communities, this is the first study that specifically addresses individual perceptions of social capital in both settings. Furthermore, to the best of our knowledge, this is the first study that examines the association between food insecurity and an individual's subjective assessment of their social position, referred to here as perceived personal disparity. Veenstra suggests that although the preponderance of theory locates social capital as a structural property of communities, that it might "exist, at least in part, in individuals," specifically as "the repository of societal norms and values (2000: 620)." Although an individual-level cross sectional study of social capital and food insecurity does not account for social capital as a structural property, it does account for the role an individual's personal evaluation of their community may play in access to food. Attitudes toward one's community are further reflected in an individual's attitude toward their subjectively evaluated position within that community. Following Veenstra's argument, significant relationships between food insecurity and individuals'

perceptions of the social environment and their place within that environment are of theoretical importance as they provide evidence of individual effects of collective social functioning on food insecurity (Veenstra, 2000).

Our study operationalizes food insecurity from the concept of food depletion at the household level, defined as a household running out of food (Kendall et al., 1995; Radimer, Olson, & Campbell, 1990). We focus on this component of the concept of food security that accounts for the sufficiency and adequacy of food in regards to its availability, access and utilization (Wolfe & Frongillo, 2001). Following from Wolfe and Frongillo (2001), we understand economic and social resources, and spatial context to play major roles in the production of food security. More specifically, we will comparatively examine the associations between food insecurity and individual level measures of collective social functioning such as social capital and perceived personal disparity, and both urban and rural setting.

Subjects and methods

Study Sample

This study is a secondary analysis of cross-sectional data. Measures for this study were derived from the 2006 Brazos Valley Health Assessment (BVHA). The BVHA was conducted by a survey research firm at Texas A&M University that identified 3,501 potential respondents through random-digit dialed telephone screening for the purpose of assessing the health of the entire seven-county Brazos Valley adult population. Telephone coverage was estimated by the 2000 Census at 96.8% for the Brazos Valley with 95.2% for rural counties (U.S. Bureau of the Census, 2000). The sample was not stratified. The response rate for completed surveys was 73.8% (2,584 respondents from 3,501 households with one individual sampled per household). The mail-out included a survey booklet, cover letter, small monetary incentive, and postage-paid envelope, followed two-weeks later with a postcard reminder. The methodology has been described elsewhere (Prochaska et al., 2006). The study protocol was approved by the Institutional Review Board at Texas A&M University. The Brazos Valley consists of six rural counties and Brazos County which is urban. We constructed a rural-residence variable based on these distinctions. The analytic sample ($n = 1,803$) included all participants who completed the food-insecurity item, which was the outcome of interest. The analytic sample did not significantly differ from the excluded sample in income, minority status, and education; there were slightly more women in the analytic sample (74.3% vs. 71.2%).

Measurements

The food insecurity indicator was the first quantitative food-depletion item in the household hunger dimension of the Radimer-Cornell measure of hunger and food insecurity (Kendall et al., 1995; Radimer et al., 1990). This statement was originally posed in the first-person singular and rewritten for the BVHA in the first-person plural to draw the respondents' attention to the household focus of the item. Respondents were asked to choose a frequency defined as "often true," "sometimes true," or "never true" to describe the following question about the food they bought for their household in the last month: "The food that we bought didn't last and we didn't have enough money to buy more." The variable was coded one for never-true to three for often-true. This will be reported as "never," "sometimes" and "often-reported food insecurity."

The items used to measure social capital and perceived personal disparity were originally developed by Burdine *et al.* (Burdine, Felix, Wallerstein, Abel, Wiltraut, Musselman et al., 1999). This measure corresponds to the extra-familial support dimension of social capital

identified by Portes (1998). A single-item index for social capital was constructed from six items using an iterated principal factor method (Release 11, 2010 Stata Statistical Software). Respondents were asked to rate six items on a five-point scale: “Strongly Agree” to “Strongly Disagree.” The first item was a positive statement, followed by five negative statements. The first item was reverse coded for the following index construction. Factor loadings for the social capital items are in parentheses: “If there is a problem in my community, the people who live here work together to get it resolved (0.59). People in the community where I live are only out for themselves (0.73). I am afraid when I am out alone after dark in my community (0.42). In my community, a small group of people have all the power (0.66). I feel like an outsider in my community (0.72). There is nothing I can do to solve problems in my community when they happen (0.72).” One factor was identified with eigenvalue of 2.53. These loadings were used to weight the contribution of each item to the social capital score. This index had a good internal consistency with a Chronbach’s α of 0.79. A standardized social capital index was calculated by dividing the score by the square of the eigenvalue. A three-level categorical index was constructed based on the quartile distribution: high social capital (lowest quartile), medium social capital (middle two quartiles), and low social capital (highest quartile) (Kim & Mueller, 1978).

The BVHA also included an item measuring respondents’ subjective evaluation of perceived personal disparity. Respondents were prompted to complete this statement: “Compared to other people in my community, I think I am,” with the following scale: “Much better off”, “A little better off”, “About the same”, “A little worse off”, and “A lot worse off (Burdine et al., 1999).” This measure is not a direct individual-level correlate of contextual measures of income inequality. Rather, it measures the respondent’s personal experience of their well being in relation to others within their community. Responses to this measure may indicate the respondents’ evaluation of their income in relation to others within the community, but may also reflect their relative access to other private and public goods.

The BVHA data included age (three categories of 18-39 years, 40-59 years, and 60 years and older), race and ethnicity (minority and non-Hispanic white), educational attainment (continuous variable with a range of 1-17 years, with greater than 17 years truncated at 17 years), gender, and household income in previous year (2005). Federal poverty level (FPL) criteria were used to construct a three-category variable for income including poverty (at or below FPL), low income (101% to 199% FPL), and above low income (greater than 199% FPL).

Statistical Analysis

Exploratory analyses of data were conducted using Stata Statistical Software Release 11 (Stata Corporation, College Station, TX). All tests for significance were two-tailed, and $p < 0.05$ was considered statistically significant. X^2 statistics were used to test for associations between personal characteristics and social measures, and food insecurity. Two sample t-tests were used to determine the significance of mean differences between rural and urban sub-samples for all continuous variables and cross tabs with X^2 statistics were used to determine percentage per category. Because of concerns arising from the increased possibility of Type I errors in cases of multiple comparisons, a Bonferroni correction was employed by dividing the alpha (0.05) by the number of tests (8), reducing the alpha to 0.006 (Kleinbaum, Kupper, & Muller, 2007).

An ordinal logistic regression model was estimated to examine the determinants of the three food-insecurity categories, followed by a Brant post estimation test. The results of the Brant test indicated the model failed to meet the proportional-odds assumption (Brant, 1990). When the parallel-regression assumption is violated, a multinomial logistic regression is a common alternative that allows one to avoid potential bias (Long & Freese, 2001). Robust

multinomial logistic regression models with White correction for non-constant variance were then used to examine the determinants of the three food-insecurity categories. The dependent variable was food insecurity, a discrete variable with three nominal categories. Adjusted odds ratios were calculated for each outcome to describe the odds of the occurrence of a particular food-insecurity category with a specific determinant, holding other covariates in the model constant.

Independent variables included education, income level (poverty, low, and moderate/high), rural residence (rural and urban), age, gender, minority status (all minority and non-Hispanic white), perceived social capital index (low, medium, and high social capital), and perceived personal disparity (continuous variable, range 1-5). Initial models were estimated without social capital and perceived personal-disparity measures, followed by the addition of the subjective measures of collective social functioning, in order to determine if these theoretically salient measures provided additional explanatory power. The Collin command in Stata was used to check for problems with multicollinearity for the final models (Ender, N.D.).

Results

The prevalence of food insecurity, personal characteristics, social capital, and perceived personal disparity are reported in Table 1. Out of 1,803 respondents, more than 25% reported running out of food in the previous month and not having enough money to buy more. Rural participants were more likely than urban counterparts to report that food insecurity in the past month occurred sometimes (18.3% vs. 16.8%) or often (8.9% vs. 4.7%, $p = 0.004$). Compared with urban participants, rural adults were older ($p < 0.001$); less educated ($p < 0.001$), and reported a lower household income ($p < 0.001$). There were no significant differences in perceived personal disparity, or in gender. A high score for any of the social capital questions indicated a positive evaluation by the respondent of their community's civic structure. With the exception of the question about safety after dark, the mean scores for rural residents (compared with urban participants) were significantly closer to a negative evaluation of their community ($p = 0.001$). Rural participants were therefore more likely to report low social-capital scores than urban respondents (28.3% vs. 16.5%, $p < 0.001$).

Results of the Collin test for multicollinearity resulted in VIF scores ranging from 1.03 to 1.94 indicating no concerns about multicollinearity. Table 2 shows the robust multinomial logistic model of the association of personal characteristics, social capital and perceived personal disparity with food insecurity for the combined rural and urban groups. An additive model was calculated and the addition of the collective social functioning variables (social capital and perceived personal disparity) to a model that only included personal characteristics and place of residence increased the proportion of variability explained by the model from 18% to 22%. Less education, younger age, membership in a minority group, residence in low-income or poor households, perceived personal disparity, low and medium social capital, and rural residence were associated with experiencing food insecurity in the previous month.

The odds of reporting that one often experienced food insecurity relative to never reporting food insecurity increased when participants were members of a minority group ($p > 0.001$), residents in a low-income ($p > 0.001$) or poor household ($p > 0.001$), rural residents ($p = 0.021$), older than 60 years of age ($p = 0.001$), perceived themselves to be worse off than others in their community ($p > 0.001$), or had low social capital ($p = 0.031$). The odds for reporting that one often experienced food insecurity relative to never reporting food insecurity decreased for those who had more education ($p > 0.001$) or were 65 or older ($p > 0.001$).

The odds of reporting that one sometimes experienced food insecurity relative to never experiencing food insecurity increased when participants were members of a minority group ($p>0.001$), residents of a poor ($p>0.001$) or low-income household ($p>0.001$), perceived themselves to be worse off than others in their community ($p>0.001$), or had low ($p>0.001$) or medium social capital ($p=0.006$). The odds of reporting that one sometimes experienced food insecurity relative to never experiencing food insecurity decreased for participants who had more education ($p=0.001$), and were between the ages of 40-59 ($p=0.003$) or greater than 65 years of age ($p>0.001$).

Gender was not significant for either of the two comparisons. Rural residence was only significant in the often/never-reported comparison where it increased the odds of often reporting food insecurity. When the analysis was stratified by urban-rural status, no substantive differences were observed in the predictors of food insecurity. The results of this stratified analysis are available in the Electronic Appendix.

Discussion

Scholars have argued environmental context plays a key role in the production of food insecurity (Wolfe & Frongillo, 2001). Our study examined the association of rural versus urban place of residence and individual measures of collective social functioning with food insecurity, in a sample consisting of rural and urban residents, and in samples stratified by rural and urban setting. Our study contributes to the small number of studies that have examined the associations between social capital and food insecurity, and we are the first to examine the association between perceived personal disparity and food insecurity. We discovered in a combined rural and urban sample a significant relationship between rural residence and food insecurity when comparing respondents who often experienced food insecurity to those who never experienced food insecurity. However, in the comparison between those who sometimes and never experienced food insecurity, rural residence was non-significant. Along with rural residence, low levels of perceived social capital and the subjective experience of personal disparity were also associated with the occurrence of food insecurity, confirming our expectation that place and measures of collective social functioning are independent covariates. The separate analyses performed on rural and urban samples indicated the importance of both perceived social capital and perceived personal disparity regardless of location. This study provides evidence that individual effects of collective social functioning are associated with food insecurity.

Food insecurity is a persistent problem for low-income and poor households in the U.S. (Drewnowski & Specter, 2004). A number of studies have identified sociodemographic characteristics such as race and ethnicity, age, education and income as key factors in the production of food insecurity, findings that are confirmed in our study.

With the exception of Gee et al., (2007), this study is the first we are aware of that has examined the association between a subjective evaluation of personal disparity and any measure of food insecurity. We found that the subjective experience of an individual's social position is of importance in understanding food insecurity. Perceived personal disparity was significantly associated with food insecurity in both samples—while controlling for income, other demographic characteristics, and social capital—reflecting the results of earlier research which examined the association of income inequality with a range of other health outcomes and nutritionally significant health concerns such as obesity and diabetes mortality rates (Pickett et al., 2005). We suggest the experience of inequality bound to difficulty in accessing resources such as food assistance programs should be explored in future research as a possible intervening variable between perceptions of personal disparity and food insecurity.

This study also contributed further evidence supporting the important and well-established association between social capital and health outcomes. Specifically, it supports the findings of a small number of earlier studies that concluded social capital is an important covariate of food insecurity (S. Garasky et al., 2006) and measures associated with food insecurity such as risk of malnutrition (Locher et al., 2005), intake of fruits and vegetables (Johnson et al., 2010), risk of hunger (Martin et al., 2004), and nutritional status among children (De Silva & Harpham, 2007). We are unaware of previous research that compares the association between social capital and food insecurity in rural and urban settings, although De Silva and Harpham's study of children's nutritional status and maternal social capital also found relatively consistent impacts across four distinct national settings in the developing world (2007). Wright Morton et al. (2008) found greater levels of reciprocal exchange to be present in rural areas and greater levels of distributional economies to be present in urban areas. They also discovered that distributional economies played a more important role in protecting against food insecurity. This may explain our discovery that mean levels of social capital were slightly higher in the urban than in the rural setting, a finding that may have initially appeared to contradict earlier findings that the bonding dimensions of social capital, especially familial exchange relationships, are stronger in rural communities (Hofferth & Iceland, 1998). Our measure of social capital focuses on extra-familial community components such as trust in one's community or community safety. Perhaps extra-familial social capital corresponds conceptually to the distributional economies identified by Wright Morton et al. (2008). Regardless of differences between rural and urban communities in mean levels of social capital, we discovered social capital was generally important for levels of food insecurity, which reflects De Silva and Harpham's cross national comparison (2007).

It is unsurprising in light of previous research that the individuals and families most at risk of often suffering food insecurity in the Brazos Valley were younger, residing in low-income and poor households, and from minority groups. We have also discovered that living in a rural setting, having a negative evaluation of one's community, and perceiving oneself as worse off than others in the community is also characteristic of those often suffering from food insecurity. Rural families and individuals should receive greater attention from those involved in public and private food assistance programs. Although it may be difficult to directly identify those with a negative evaluation of their community or who perceive themselves as worse off than others, programs intended to ameliorate the lives of the food insecure should take into account the situation of such individuals. A suggestion based on an item used to construct the social capital measure would be to make special accommodations for individuals who do not feel safe in their community after dark to access food assistance in a more secure manner.

Our analysis of subjective measures of perceived personal disparity and social capital provides us with knowledge of how individuals experience these phenomena. Perception can be extremely important in the implementation of social policy as individuals are likely to base their beliefs and actions on their subjective perceptions rather than a careful evaluation of the objective social environment. For example, an individual may very well live within a community with a wide range of food resources targeted towards those who suffer from food insecurity. However, if their subjective evaluation of their community is negative, they may assume these resources do not exist and make little attempt to seek them out. While community based food and nutrition interventions must be available to those suffering from food insecurity, they may not be accessible by those who negatively evaluate the collective social functioning of their community. These individuals must be simultaneously targeted by interventions tailored to overcome their negative evaluation. Such interventions may simply make these individuals aware of these resources, or they may make other efforts such as the provision of transportation to improve accessibility.

Our study is cross-sectional, making it more difficult to interpret social capital and perceived personal disparity in terms of causality. Social capital and perceived personal disparity may have an impact on food insecurity. However, causality may operate in the opposite direction, thus suffering from food insecurity may inspire negative perceptions among individuals of their social circumstances. Another plausible interpretation would be a reflexive relationship between collective social functioning and food insecurity, such that one's negative view of their community in general as well as their place within that community could serve as a stressor to increase food insecurity while this deterioration in circumstance would simultaneously limit their evaluation of collective social functioning.

We are comfortable asserting that rural and urban settings are likely to vary in their association with food insecurity, both nationwide, and internationally. Nonetheless, we found similar relationships in urban and rural settings between food security and both perceived social capital and perceived personal disparity suggesting a similar role across contexts in our study region for these perceptions of local opportunity structures. They should be considered by those conducting research, not only in rural and urban settings within the U.S., but by scholars struggling to understand food insecurity in the many developing nations undergoing the nutrition transitions that accompany rapid urbanization and the accompanying transformations of rural food environments (Popkin, 2002).

Our study did not directly measure social capital as an objective property of the community. Instead, we examined the perceptions of study participants of a range of community characteristics—an individual level measure of social capital (Locher et al., 2005; Macintyre et al., 2002; Veenstra, 2000). Our measure of perceived personal disparity is also an individual level measure of relative position within a community rather than an objective measure of inequality within a community. The evaluation of perceptual measures is one among many practices for measuring collective social functioning in a literature that has yet to settle on a common standard for measuring social capital. The relationship between perceived social capital, perceived personal disparity and food insecurity begs a number of questions to be answered by future research. Food insecurity varies and a range of measures should be included in future exploration of the impact of social organization on these many forms of nutritional disparity. The measures in this study of social capital and perceived personal disparity should be complemented in future research with contextual measures of income inequality and social capital using multi-level statistical modeling techniques, as well as measures of collective social functioning (Macintyre et al., 2002). At the contextual level, less generalized measurements of social capital and perceived personal disparity should be constructed, including subjective measures of overall inequality within communities. Furthermore, these measures of collective social functioning should subjectively and objectively evaluate social institutions that directly impact food insecurity including distributional and reciprocal food economies (Wright Morton et al., 2008). Earlier work has addressed institutions such as distinct forms of food-resource exchange including distributional and reciprocal economies (Wright Morton et al., 2008). Such institutional measures of social exchange would be complementary to generalized measures of social capital at the individual and contextual levels, and would enable an examination of the possible interactions between people and place (Cummins, Curtis, Diez-Roux, & Macintyre, 2007).

Finally, the general measure of perceived personal disparity encompasses a wide range of social disparities. A respondent may consider him or herself worse off than others in their community based on an evaluation of after-tax income distribution; however it is far more likely that perceived personal disparity is based on more visible forms of disparity. An individual's perception of their relative position within a community is likely to take into account their access to a broad variety of resources such as ownership of property, access to

public goods such as redistributive social programs, public transportation or local parks, or even access to social capital and the resources made possible through these social relations. Relative ability to sustain food security might be a further criterion by which individuals assess their position relative to their neighbors. Future research should seek more refined measures of distinct forms of perceived personal disparity to develop a richer characterization of the role that social organization and social disparities play in relation to food insecurity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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References

- Adams E, Grummer-Strawn L, Chavez G. Food insecurity is associated with increased risk of obesity in California women. *Journal of Nutrition*. 2003; 133(4):1070. [PubMed: 12672921]
- Alaimo K, Briefel R, Frongillo E Jr, Olson C. Food insufficiency exists in the United States: results from the third National Health and Nutrition Examination Survey (NHANES III). *American Journal of Public Health*. 1998; 88(3):419. [PubMed: 9518974]
- Bickel G, Nord M, Price C, Hamilton W, Cook J. Guide to measuring household food security, revised 2000. US Department of Agriculture, Food and Nutrition Service. 2000
- Blanchard, T.; Lyson, T. Food Availability and Food Deserts in the Nonmetropolitan South. 2006. http://srcd.msstate.edu/focusareas/health/fa/fa_12_blanchard.pdf
- Bourdieu, P. The Forms of Capital. In: Richardson, JG., editor. *Handbook of Theory and Research for the Sociology of Education*. Greenwood Press; New York: 1986. p. 241-258.
- Brant R. Assessing proportionality in the proportional odds model for ordinal logistic regression. *Biometrics*. 1990; 46(4):1171-1178. [PubMed: 2085632]
- Burdine J, Felix M, Wallerstein N, Abel A, Wiltraut C, Musselman Y, et al. Measurement of social capital. *Annals of the New York Academy of Sciences*. 1999; 896:393. [PubMed: 10681932]
- Cummins S, Curtis S, Diez-Roux A, Macintyre S. Understanding and representing place in health research: A relational approach. *Social Science & Medicine*. 2007; 65(9):1825-1838. [PubMed: 17706331]
- De Silva M, Harpham T. Maternal social capital and child nutritional status in four developing countries. *Health and Place*. 2007; 13(2):341-355. [PubMed: 16621665]
- Dean WR, Sharkey JR. Rural and urban differences in the associations between characteristics of the community food environment and fruit and vegetable intake. *Journal of Nutrition Education and Behavior*. N.D.
- Dietz WH. Does hunger cause obesity? *Pediatrics*. 1995; 95:766-767. [PubMed: 7724321]
- Drewnowski A, Specter S. Poverty and obesity: the role of energy density and energy costs. *American Journal of Clinical Nutrition*. 2004; 79(1):6. [PubMed: 14684391]
- Dunn RA, Sharkey JR, Lotade-Manje J, Bouhlal Y, Nayga RM. Socioeconomic status, racial composition and the affordability of fresh fruits and vegetables in neighborhoods of a large rural region in Texas. N.D. Under review.
- Ender, PB. Collin: command to compute collinearity diagnostics UCLA. Academic Technology Services, Statistical Consulting Group; N.D.
- Furey S, Strugnell C, McIlveen M. An investigation of the potential existence of "food deserts" in rural and urban areas of Northern Ireland. *Agriculture and Human Values*. 2001; 18(4):447-457.

- Garasky S, Wright Morton L, Greder KA. The food environment and food insecurity: Perceptions of rural, suburban, and urban food pantry clients in Iowa. *Family Economics and Nutrition Review*. 2004; 16(2):41–48.
- Garasky S, Wright Morton L, Greder KA. The effects of the local food environment and social support on rural food insecurity. *Journal of Hunger & Environmental Nutrition*. 2006; 1(1):83–103–183–103.
- Gee G, Lively K, Larsen L, Keith J, Stone J, MacLeod K. Hungry for respect: discrimination among adults using emergency food services. *Journal of Health Disparities Research and Practice*. 2007; 2(1):1–20.
- Gorman KS, Horton KD, Houser R. Food security, hunger, and Food Stamp participation among low income working families in Rhode Island. *Journal of Hunger & Environmental Nutrition*. 2006; 1(1):105–125.
- Hamilton, W.; Cook, J.; Thompson, W.; Buron, L.; Frongillo, E., Jr; Olson, C., et al. Household food security in the United States in 1995: Summary report of the Food Security Measurement Project. United States Department of Agriculture; Washington, DC: 1997.
- Hofferth S, Iceland J. Social capital in rural and urban communities. *Rural Sociology*. 1998; 63:574–598.
- Innes, JE. Knowledge and public policy: the search for meaningful indicators. Transaction Publishers; New Brunswick: 1994.
- Jensen, L.; McLaughlin, DK.; Slack, T. Challenges for Rural America in the Twenty-First Century. Penn State University; University Park, PA: 2003. Rural poverty: the persisting challenge; p. 118–134.
- Johnson CM, Sharkey JR, Dean WR. Eating behaviors and social capital are associated with fruit and vegetable intake among rural adults. *Journal of Hunger and Environmental Nutrition*. 2010; 5(3)
- Kahn H, Tatham L, Pamuk E, Heath C Jr. Are geographic regions with high income inequality associated with risk of abdominal weight gain? *Social Science & Medicine*. 1998; 47(1):1–6. [PubMed: 9683373]
- Kaiser L, Melgar-Quinonez H, Lamp C, Johns M, Sutherlin J, Harwood J. Food security and nutritional outcomes of preschool-age Mexican-American children. *Journal of the American Dietetic Association*. 2002; 102(7):924–929. [PubMed: 12146552]
- Kaplan G, Pamuk E, Lynch J, Cohen R, Balfour J. Inequality in income and mortality in the United States: analysis of mortality and potential pathways. *British Medical Journal*. 1996; 312(7037):999. [PubMed: 8616393]
- Kaufman P. Rural poor have less access to supermarkets, large grocery stores. *Rural Development Perspectives*. 1998; 13(3):19–26.
- Kawachi I, Kennedy B. Socioeconomic determinants of health: health and social cohesion: why care about income inequality? *BMJ*. 1997; 314(7086):1037. [PubMed: 9112854]
- Kawachi I, Kennedy B. Income inequality and health: pathways and mechanisms. *Health services research*. 1999; 34(1 Pt 2):215. [PubMed: 10199670]
- Kawachi I, Kennedy B, Glass R. Social capital and self-rated health: a contextual analysis. *American Journal of Public Health*. 1999; 89(8):1187. [PubMed: 10432904]
- Kawachi I, Kennedy B, Lochner K, Prothrow-Stith D. Social capital, income inequality, and mortality. *American Journal of Public Health*. 1997; 87(9):1491. [PubMed: 9314802]
- Kendall A, Olson C, Frongillo E. Relationship of hunger and food insecurity to food availability and consumption. *Journal of the American Dietetic Association*. 1996; 96(10):1019–1024. [PubMed: 8841164]
- Kendall A, Olson C, Frongillo E Jr. Validation of the Radimer/Cornell measures of hunger and food insecurity. *Journal of Nutrition*. 1995; 125(11):2793. [PubMed: 7472659]
- Kim, J.; Mueller, C. Factor analysis: statistical methods and practical issues. Sage Pubns; 1978.
- Kleinbaum, D.; Kupper, L.; Muller, K. Applied regression analysis and other multivariable methods. Duxbury Pr; 2007.
- Lee JS, Frongillo EA Jr. Nutritional and health consequences are associated with food insecurity among U.S. elderly persons. *Journal of Nutrition*. 2001; 131(5):1503–1509. [PubMed: 11340107]

- Lobao L, Saenz R. Spatial inequality and diversity as an emerging research area. *Rural Sociology*. 2002; 67(4):497–511.
- Locher J, Ritchie C, Roth D, Baker P, Bodner E, Allman R. Social isolation, support, and capital and nutritional risk in an older sample: ethnic and gender differences. *Social Science & Medicine*. 2005; 60(4):747–761. [PubMed: 15571893]
- Lochner K, Kawachi I, Kennedy B. Social capital: a guide to its measurement. *Health and Place*. 1999; 5(4):259–270. [PubMed: 10984580]
- Long, J.; Freese, J. Regression models for categorical dependent variables using Stata. Stata Press; College Station, TX: 2001.
- Macintyre S, Ellaway A, Cummins S. Place effects on health: how can we conceptualise, operationalise and measure them? *Social Science & Medicine*. 2002; 55(1):125–139. [PubMed: 12137182]
- Martin K, Rogers B, Cook J, Joseph H. Social capital is associated with decreased risk of hunger. *Social Science & Medicine*. 2004; 58(12):2645–2654. [PubMed: 15081212]
- McIntosh, WA. *Sociologies of Food and Nutrition*. Plenum Press; New York, NY: 1996.
- Morris P, Neuhauser L, Campbell C. Food security in rural America: A study of the availability and costs of food. *Journal of Nutrition Education (USA)*. 1992
- Nord, M.; Andrews, M.; Carlson, S. Household food security in the United States, 2008. U.S Dept. of Agriculture, Economic Research Service; 2009.
- Oshio T, Kobayashi M. Income inequality, area-level poverty, perceived aversion to inequality, and self-rated health in Japan. *Social Science & Medicine*. 2009; 69(3):317–326. [PubMed: 19540032]
- Pearce J, Witten K, Hiscock R, Blakely T. Regional and urban-rural variations in the association of neighbourhood deprivation with community resource access: a national study. *Environment and Planning A*. 2008; 40(10):2469–2489.
- Pickett K, Kelly S, Brunner E, Lobstein T, Wilkinson R. Wider income gaps, wider waistbands? An ecological study of obesity and income inequality. *Journal of Epidemiology and Community Health*. 2005; 59(8):670. [PubMed: 16020644]
- Popkin B. The shift in stages of the nutrition transition in the developing world differs from past experiences! *Malaysian Journal of Nutrition*. 2002; 8(1):109–124.
- Portes A. Social capital: its origins and applications in modern sociology. *Annual Review of Sociology*. 1998; 24(1):1–24.
- Prochaska JD, Sharkey JR, Ory MG, Burdine JN. Assessing healthful eating among community dwelling rural older adults using self-reported fruit and vegetable consumption via a community-wide mail-out health status assessment. *Journal of Nutrition For the Elderly*. 2006; 25(2):101–112. [PubMed: 17182469]
- Radimer K, Olson C, Campbell C. Development of indicators to assess hunger. *Journal of Nutrition*. 1990; 120(11 Suppl):1544. [PubMed: 2243303]
- Rose D. Economic determinants and dietary consequences of food insecurity in the United States. *Journal of Nutrition*. 1999; 129(2):517.
- Seefeldt, KS.; Castelli, T. Low-income women's experiences with food programs, food spending, and food-related hardships: evidence from qualitative data. Economic Research Service: Food and Nutrition Assistance Program; Washington, D.C.: 2009.
- Sharkey JR. Risk and presence of food insufficiency are associated with low nutrient intakes and multimorbidity among homebound older women who receive home-delivered meals. *Journal of Nutrition*. 2003; 133:3485–3491. [PubMed: 14608062]
- Sharkey JR. Longitudinal examination of homebound older adults who experience heightened food insufficiency: effect of diabetes status and implications for service provision. *The Gerontologist*. 2005; 45(6):773–782. [PubMed: 16326659]
- Sharkey J, Horel S, Han D, Huber J. Association between neighborhood need and spatial access to food stores and fast food restaurants in neighborhoods of Colonias. *International Journal of Health Geographics*. 2009; 8(1):9. [PubMed: 19220879]
- Sharkey JR. Measuring potential access to food stores and food-service places in rural areas in the US. *American Journal of Preventive Medicine*. 2009; 36(4S):151–155.

- Sharkey JR, Horel S. Neighborhood socioeconomic deprivation and minority composition are associated with better potential spatial access to the ground-truthed food environment in a large rural area. *Journal of Nutrition*. 2008; 138(3):620–627. [PubMed: 18287376]
- Sharkey JR, Horel SA, Dean WR. Neighborhood deprivation, vehicle ownership, and potential spatial access to a variety of fruits and vegetables in a large rural area in Texas. *International Journal of Health Geographics*. 2010; 9:26. [PubMed: 20500853]
- Sharkey JR, Johnson C, Dean WR. Food access and perceptions of the community and household food environment as correlates of fruit and vegetable intake among rural seniors. *BMC Geriatrics*. 2010; 10(1):32. [PubMed: 20525208]
- Smith C, Wright Morton L. Rural food deserts: low-income perspectives on food access in Minnesota and Iowa. *Journal of Nutrition Education and Behavior*. 1994; 41(3):176–187. [PubMed: 19411051]
- Townsend M, Peerson J, Love B, Achterberg C, Murphy S. Food insecurity is positively related to overweight in women. *Journal of Nutrition*. 2001; 131(6):1738. [PubMed: 11385061]
- Veenstra G. Social capital, SES and health: an individual-level analysis. *Social Science and Medicine*. 2000; 50(5):619–630. [PubMed: 10658843]
- Veenstra G. Location, location, location: contextual and compositional health effects of social capital in British Columbia, Canada. *Social Science & Medicine*. 2005; 60(9):2059–2071. [PubMed: 15743654]
- Wilkinson R. Income inequality, social cohesion, and health: clarifying the theory--a reply to Muntaner and Lynch. *International Journal of Health Services*. 1999; 29(3):525–543. [PubMed: 10450545]
- Wolfe W, Frongillo E. Building household food-security measurement tools from the ground up. *Food Nutr Bull*. 2001; 22:5–12.
- Wright Morton L, Bitto EA, Oakland MJ, Sand M. Solving the problems of Iowa food deserts: food insecurity and civic structure. *Rural Sociology*. 2005; 70(1):94–112–194–112.
- Wright Morton L, Bitto EA, Oakland MJ, Sand M. Accessing food resources: rural and urban patterns of giving and getting food. *Agriculture and Human Values*. 2008; 25(1):107–119.



Figure 1.
Conceptual Model of food insecurity and determinants of access to food resources

Table 1

Sociodemographic profile of analytic sample from the 2006 Brazos Valley Health Survey for combined (n=1,803), urban (n=570) and rural (n=1,233) samples including food insecurity, personal characteristics, social capital, and perceived personal disparity

Variable	% of Total (n)	% of Urban (n)	% of Rural (n)	P
<i>Food Insecurity</i>				
The food that we bought didn't last and we didn't have enough money to buy more. ^c				
Never true, % ^d	74.60(1,345)	78.42(447)	72.83(898)	0.004 ^{a, b}
Sometimes true, %	17.80(321)	16.84(96)	18.25(225)	0.004 ^a
Often true, %	7.60(137)	4.74(27)	8.92(110)	0.004 ^a
<i>Personal characteristics</i>				
Age, mean \pm SD ^e	53.26 \pm 15.70	49.94 \pm 16.33	54.80 \pm 15.29	0.000 ^a
18-39 years, %	19.97(360)	26.67(152)	16.87(208)	0.000 ^a
40-59 years, %	43.42(783)	44.21(252)	43.07(531)	0.648
≥ 60 years, %	36.61(660)	29.12(166)	40.06(494)	0.000 ^a
% Female	74.27(1,339)	73.16(417)	74.78(922)	0.465
Education, mean \pm SD	13.09 \pm 2.07	13.57 \pm 2.28	12.87 \pm 1.93	0.000 ^a
Minority, %	19.97 (360)	22.63 (129)	18.73 (231)	0.054
Household Income, mean \pm SD	46,360 \pm 26,742	52,075 \pm 27,232	43,676 \pm 26,742	0.000 ^a
Poverty, % ^f	16.64 (300)	14.21 (81)	17.76 (219)	0.060
Low income, % ^g	15.36 (277)	11.40 (65)	17.19 (212)	0.002 ^a
Medium/high income, % ^h	68.00(1,226)	74.39(424)	65.04(802)	0.000 ^a
<i>Social environment</i>				
Perceived personal disparity, mean \pm SD ⁱ	2.57 \pm 0.90	2.56 \pm 0.81	2.58 \pm 0.93	0.627
<i>Social capital, mean \pm SD^j</i>				
If there is a problem in my community, the people who live here work together to get it resolved (reverse coded).	3.33 \pm 0.93	3.43 \pm 0.86	3.29 \pm 0.96	0.001 ^a
People in the community where I live are only out for themselves.	3.39 \pm 0.98	3.51 \pm 0.93	3.33 \pm 1.00	0.000 ^a
I am afraid when I am out alone after dark in my community.	3.72 \pm 1.07	3.70 \pm 1.08	3.73 \pm 1.07	0.704
In my community, a small group of people have all the power.	3.09 \pm 1.13	3.40 \pm 0.98	2.95 \pm 1.17	0.000 ^a
I feel like an outsider in my community.	3.71 \pm 1.06	3.90 \pm 0.92	3.62 \pm 1.10	0.000 ^a
There is nothing I can do to solve problems in my community when they happen.	3.53 \pm 1.01	3.75 \pm 0.88	3.44 \pm 1.05	0.000 ^a
<i>Social capital index categories, %</i>				
High social capital	24.23 (438)	28.72 (164)	22.15 (274)	0.001 ^a
Medium social capital	51.22 (926)	54.82 (313)	49.56 (613)	0.019
Low social capital	24.56 (444)	16.46 (94)	28.29 (350)	0.000 ^a

Notes:

P value results from cross tabulations are Pearson χ^2 chi-squared.

* significant at $p \leq 0.05$.

[†] significant at $p < 0.01$.

[‡] significant at $p < 0.001$.

^a P-values are from t-test comparisons of urban and rural differences.

^b Statistically significant after Bonferroni adjustment for multiple comparisons $p < 0.006$.

^c Response categories: 1 = Never True, 2 = Sometimes True, 3 = Often True

^d All percentages are from cross tabulations.

^e All means \pm standard deviations are from two sample tests of group means.

^f Poverty household income = $\leq 100\%$ Federal Poverty Level.

^g Low household income = 101 to 199% Federal Poverty Level.

^h Medium/high household income $\geq 200\%$ Federal Poverty Level.

ⁱ Compared to other people in my community, I think I am: 1 = Much better off; 2 = A little better; 3 = About the same; 4 = A little worse off; 5 = A lot worse off.

^j Response categories: 1 = Strongly Agree; 2 = Agree; 3 = Unsure; 4 = Disagree; 5 = Strongly Disagree.

Table 2

Robust multinomial logit model results on food insecurity and its association with personal characteristics, social capital, and perceived personal disparity for the combined urban and rural participants (n = 1803) in 2006 Brazos Valley Health Survey (never reported food insecurity is reference category)

	Sometimes reported food insecurity		Often reported food insecurity	
	Odds ratio	95% confidence interval Lower bound Upper bound	Odds ratio	95% confidence interval Lower bound Upper bound
<i>Personal characteristics</i>				
Education	0.88 [†]	0.82 0.95	0.85 [‡]	0.78 0.93
Age (18 to 39 y)				
40-59 y	0.60 [†]	0.42 0.84	1.05	0.61 1.81
≥60	0.24 [‡]	0.16 0.36	0.35 [†]	0.19 0.63
Female (male)	1.23	0.88 1.70	1.66	0.95 2.93
Minority (non-Hispanic white)	2.61 [‡]	1.89 3.60	4.28 [‡]	2.74 6.66
Household income (≥200% FPL)				
Poverty	2.45 [‡]	1.71 3.53	7.71 [‡]	4.61 12.89
Low income	3.57 [‡]	2.52 5.08	4.26 [‡]	2.43 7.45
<i>Rural and urban setting</i>				
Rural residence (urban residence)	1.10	0.81 1.50	1.83 [*]	1.10 3.06
<i>Social environment</i>				
Perceived personal disparity	1.47 [‡]	1.25 1.72	2.14 [‡]	1.62 2.84
Social capital (high social capital)				
Medium	1.73 [†]	1.17 2.57	0.73	0.41 1.20
Low	2.90 [‡]	1.91 4.41	1.87 [*]	1.51 4.63
Wald chi ² (df)	374.95(22)			
Prob > chi ²	0.0000			
Log pseudolikelihood	-1018.09			
McFadden's Pseudo r ²	0.22			

Notes: reference categories in parentheses; significance level:

* = significant at $p \leq 0.05$.

\dagger = significant at $p < 0.010$.

\ddagger = significant at $p < 0.001$.